A Marshall Cavendish Collection

EVERY FORTNIGHT

QUEST

ADVENTURES IN THE WORLD OF SCIENCE

WEATHER

11

FACT FILES ON:

- Fundamental forces
- Elements in action
- Violent weather
- Harmful radiation
- Coping with cold
- Harnessing weather power
- SAD syndrome
- Meteorology

THREE PROJECTS

MAKE A WINDMILL

GIANT POSTER WEATHER CHART

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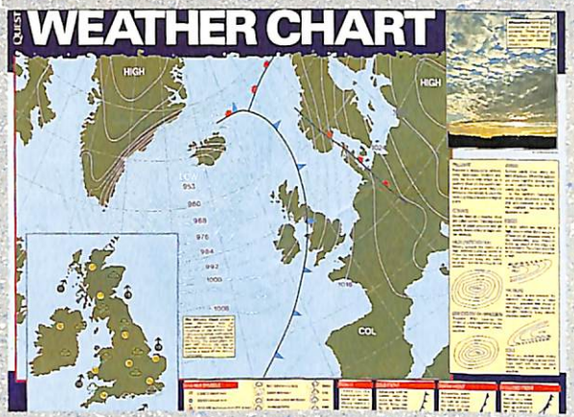
INSIDE THIS PACK

FACT FILES

- Temperature and pressure
- Tornadoes
- Hypothermia
- Forecasting
- Seeding clouds
- Wind power
- Negative ions
- Weather systems



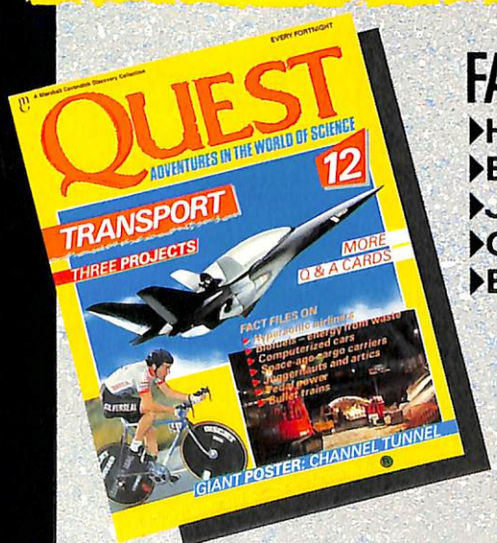
POSTER Weather chart

MODEL Make a windmill

PROJECTS

- Tracking a storm
- Making a rain gauge
- Measuring humidity

IN QUEST *12 TRANSPORT*

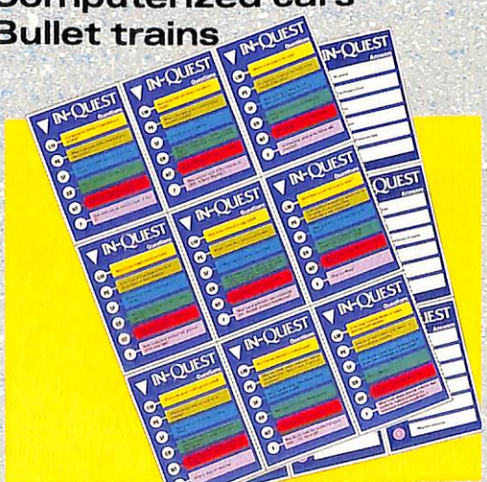


FACT FILES INCLUDE

- Hypersonic airliners
- Biofuels
- Jet-age ships
- Computerized cars
- Bullet trains

POSTER Channel tunnel

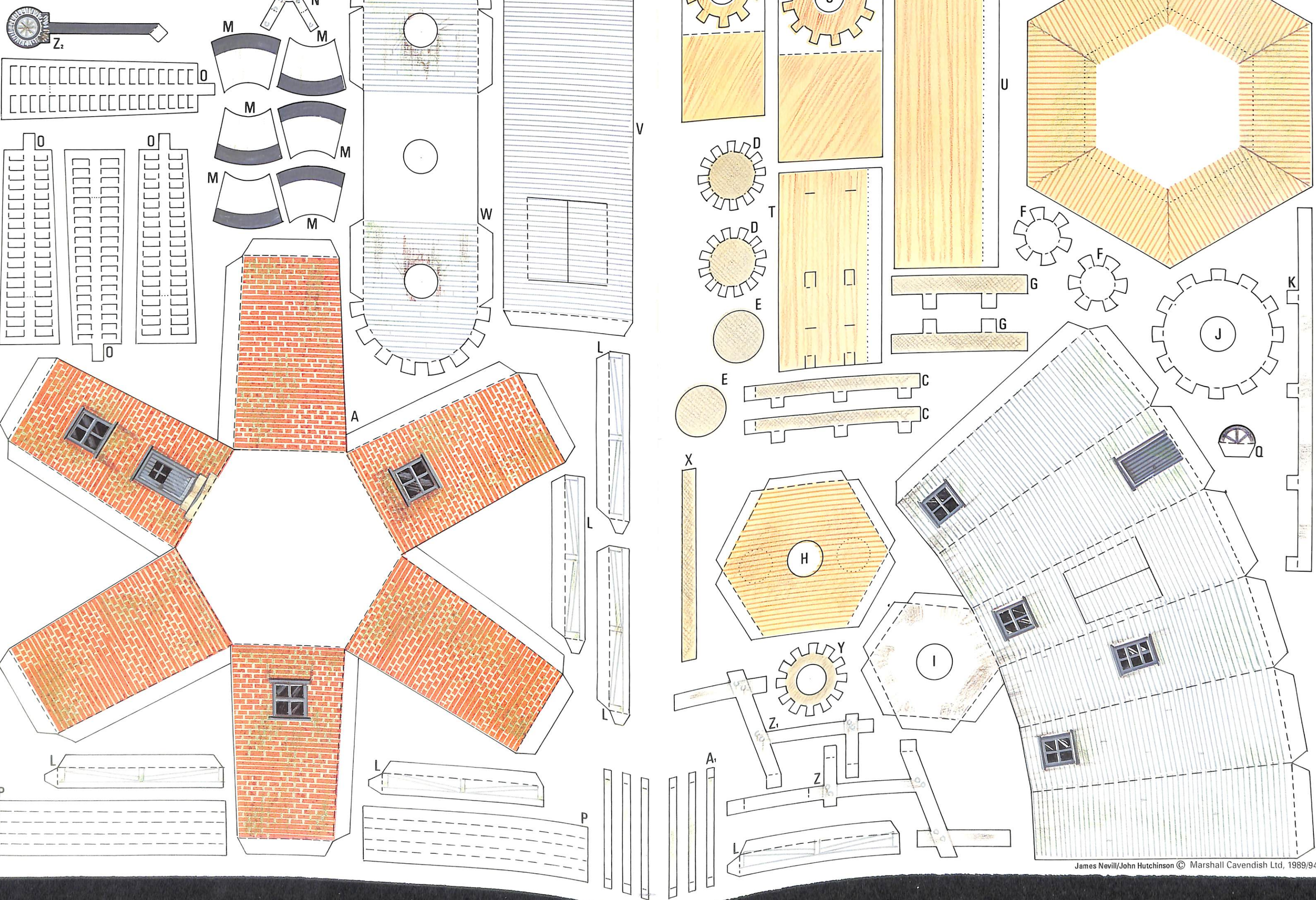
PLUS *DataQuest* update

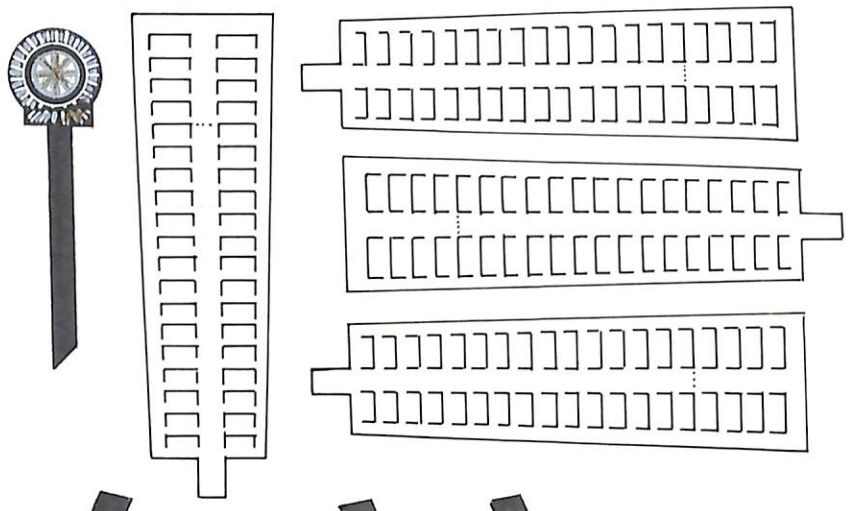


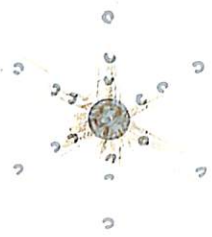
More *In-Quest* Q & A cards

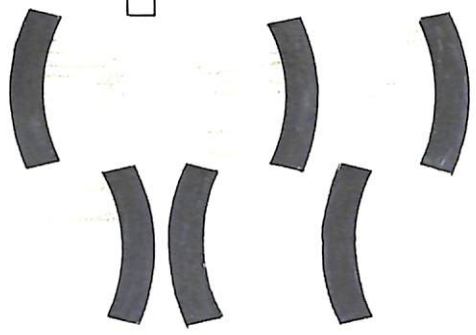
ISSN 1350-3766

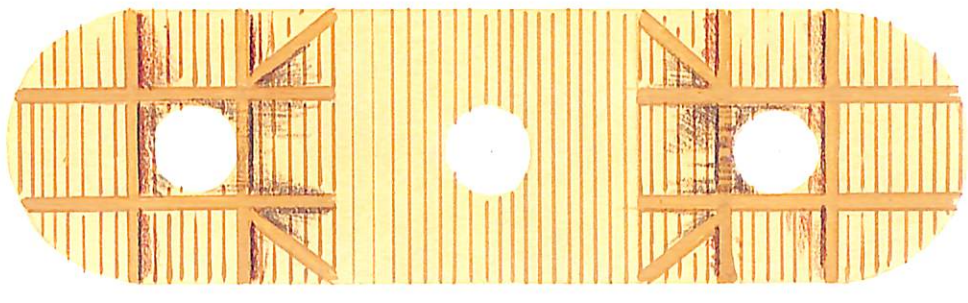
WINDMILL

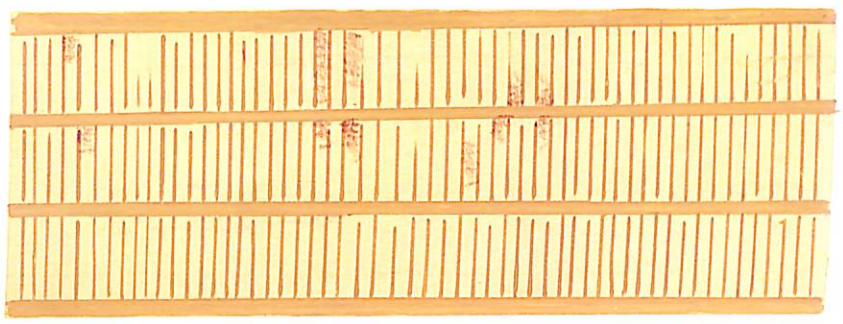


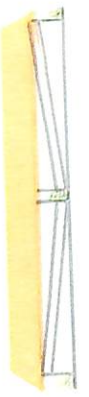


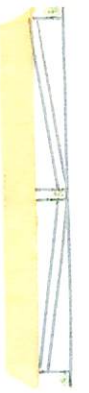


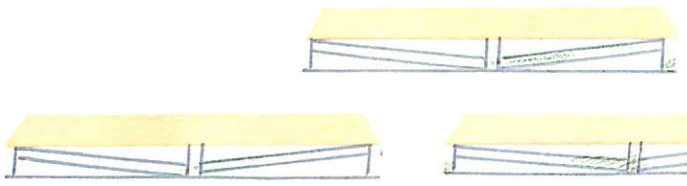


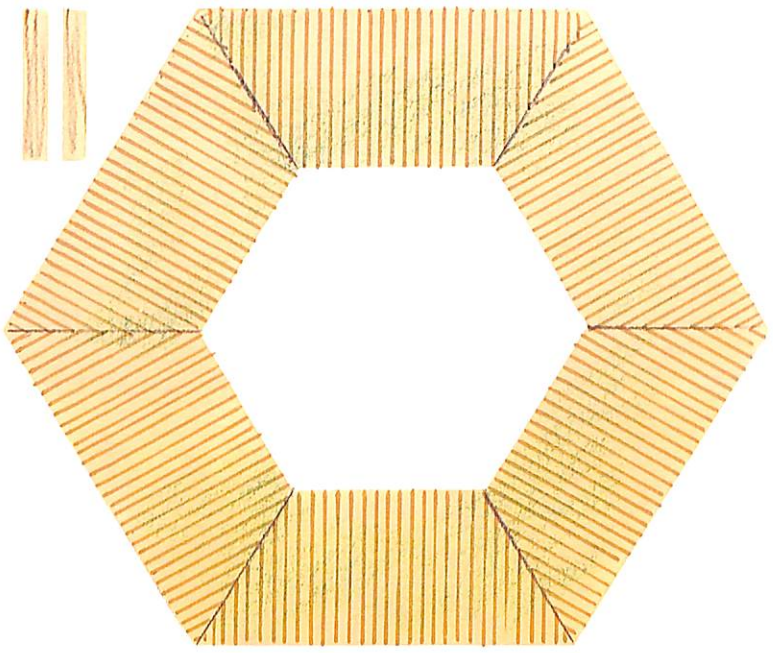








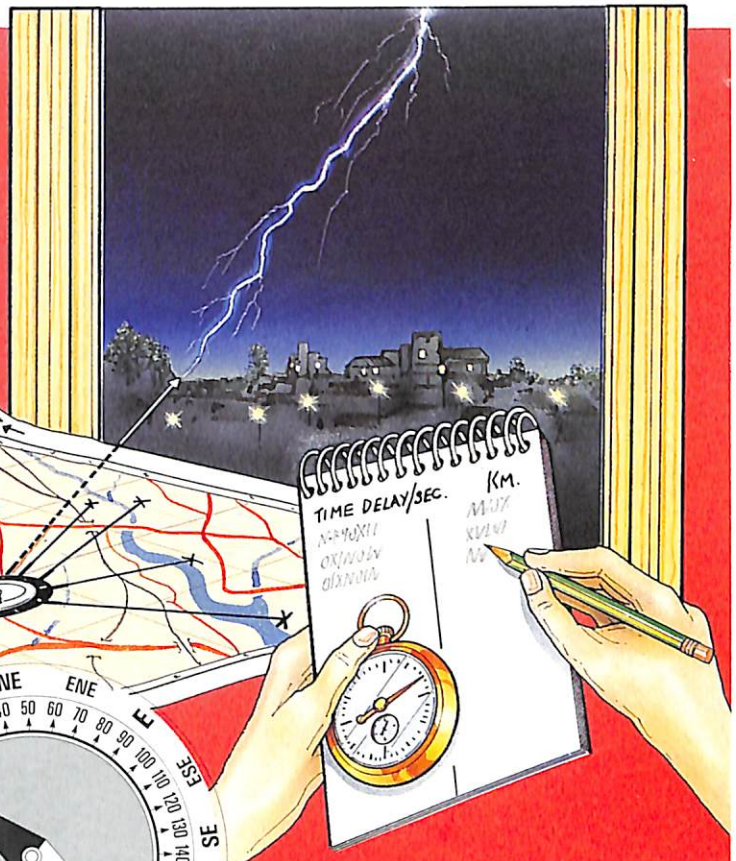




Q PROJECTS

WEATHER

- How can you plot the path of a thunderstorm?
- How can you measure your local rainfall?
- How can you check the air's water vapour?

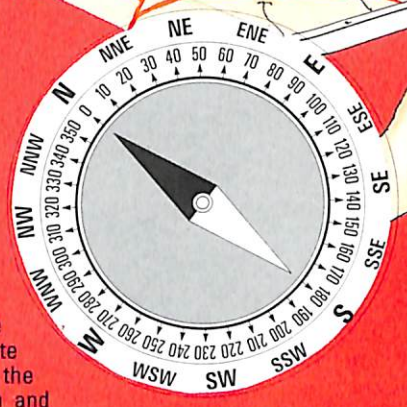


TRACKING A STORM

1 2 3 4 5

Noting the direction of lightning and the time delay between lightning and thunder will enable you to plot the path of a storm on a map.

When a thunderstorm occurs, observe it from a window with a local map in front of you. Place a compass over your position on the map. Turn the map so that its north arrow aligns with the north end of the compass needle. And turn the compass until the north mark on its scale aligns with the needle. Start the stopwatch when you see a lightning flash and stop the watch when you hear the thunder. Note the time delay and mark the direction of the flash on the map. Reset the stopwatch and repeat the procedure each time a flash occurs. Lightning reaches you almost immediately, while the sound of thunder takes about three seconds to travel 1 km. So the number of seconds, divided by three, will tell you how many kilometres away each flash is. When the storm has passed, draw lines on the map from your position through the direction marks you have made. Then calculate the distance to each flash – and mark with a cross on the map to plot the path of the storm.

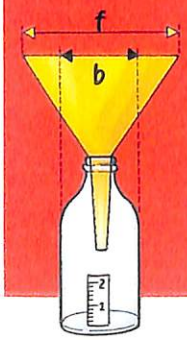


RAIN GAUGE

1 2 3 4 5

A plastic funnel and a bottle with a centimetre scale attached are all you need to make a rain-measuring gauge.

Obtain a clear glass or plastic bottle with a flat bottom and a plastic funnel to fit. A large funnel will collect more water, thus making it easier to measure the rainfall. Measure the base to find the inside diameter of the bottle (**b**), and measure the top of the funnel (**f**). Divide **f** by **b** and then multiply the answer by itself. This tells you how many centimetres along the scale correspond to each centimetre of rainfall. See how much water collects in a day.

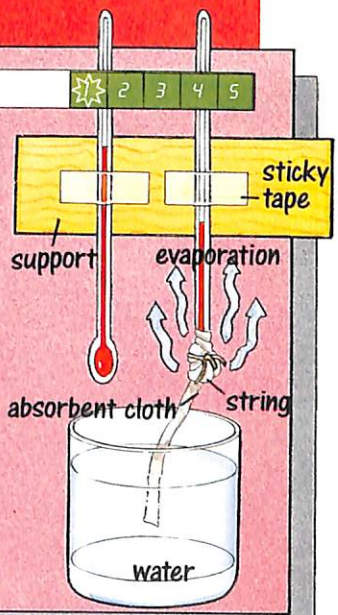


MEASURING HUMIDITY

1 2 3 4 5

Water evaporates more slowly into moist air. So measuring the cooling caused by evaporation allows us to check the air's moisture.

Get two thermometers. Bind absorbent cloth around one bulb, leaving a trailing end, and arrange so that the cloth soaks up water. The temperature on the thermometer with the cloth will become lower as water evaporates. The lower the humidity, the greater the difference in temperatures.



PROJECT INFORMATION

1 2 3 4 5

Each **QUEST** project has its own difficulty rating: 1 very simple, 2 simple, 3 intermediate, 4 advanced, 5 complicated.

WARNING!

Parents should supervise experiments involving sharp tools, water and electricity. The publisher can accept no responsibility for injury.

MODEL WINDMILL

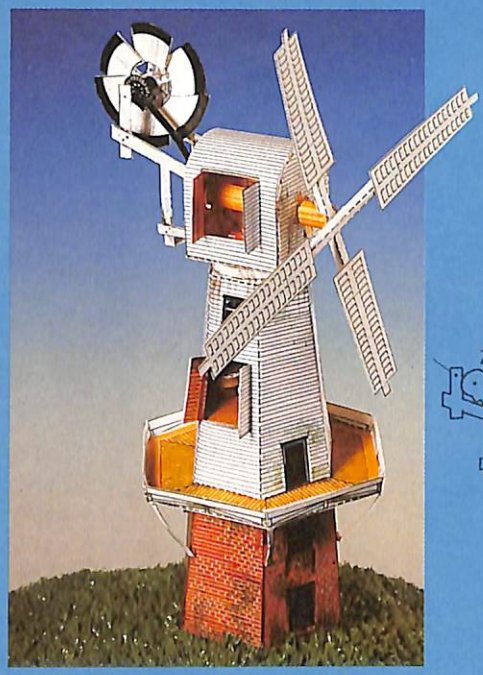
ASSEMBLY INSTRUCTIONS

You will need

Scissors • Ruler • Craft knife • Glue • 5 cm-long pin

Before cutting out the pieces, score along all broken lines with a blunt edge and ruler to make folding and gluing easier. Study the ASSEMBLY DIAGRAM to see how the pieces fit together, and use dotted lines as a guide for positioning.

NB Younger children will need supervision when using a craft knife.



To make up

Ground floor

1 Cut out base **A**, bend sides upwards and glue flaps to adjacent sections.

2 Cut out gallery **B** and glue on top (see ASSEMBLY DIAGRAM). Cut out six struts **A1** and glue in place.

Millstones

1 Cut out two millstone parts **C** and two **D**. Bend down tabs on **D**, wrap **C** round **D** and glue.

2 Cut out two circles **E**. Place **E** on underside of **D** and glue. Repeat for second millstone. Cut out two millstone parts **F** and two **G**. Bend down tabs. Wrap **G** round **F** and glue. Repeat with second **F** and **G**. Bend tabs of **G** inwards.

3 Glue **F** to circle **E**, placing exactly in centre. Repeat for second millstone.

Tower section

1 Cut out floor **H**. Glue millstones **G** on to dotted circles on **H**.

2 Cut out tower **I**. Glue floor **H** to **I** level with bottom of door. Fold tower to shape and glue. Fold side tabs of top and glue down.

3 Place **I** on **B** and glue. Cut out five toe-boards **L**. Glue in position on **B**.

4 Cut out collar parts **J** and **K**. Bend down tabs of **J**. Wrap **J** round **K** and glue.

5 Bend down tabs of **K** and glue to top of **I**, matching inner circles exactly.

Top storey

1 Cut out cog sections **R** and **S** as rectangles. Fold in half along dotted lines and glue. Then cut out cogs (double thickness).

2 Cut out horizontal shaft **T**. Cut slits and flaps where marked. Cut out vertical shaft **U**. Wrap shafts **T** and **U** round pencil to form curve. Roll so that **T** goes through hole in **S** and **U** goes through hole in **R**. Glue shafts.

3 Put **T** through hole in **S**. Glue at tabs.

4 Insert shaft **U** through hole in cog **R** in same way. Glue top tabs on **U** to **R**.

5 Cut out side section **W**. Bend tabs inwards, but do not glue yet. Push shaft **T** through holes in **W**. The cogs will interlock when sails turn.

6 Cut out roof **V**. Position so door is on same side as tower door. Glue **V** to **W** at back only.

7 Cut out central millstone parts **X** and **Y**. Bend down tabs on **Y**. Wrap **X** round **Y** and glue.

Assembling central shaft

1 Insert shaft **U** through central holes in **J** and **I** then (putting fingers through door) through millstone **Y** and finally through floor **H**.

2 Glue base of **W** to top of **J**.

3 Cut out struts **T1** and **T2**. Insert through slits in shaft **T**. Bend over **V** and glue to sides **W** to complete top of mill.

4 Cut out flywheel **Q**, bend tab and glue to bottom of **W**.

Sails and fantail

1 Cut out central cog **N** and pierce hole in centre. Cut out six fans **M** and glue to **N** at dotted lines, overlapping each one.

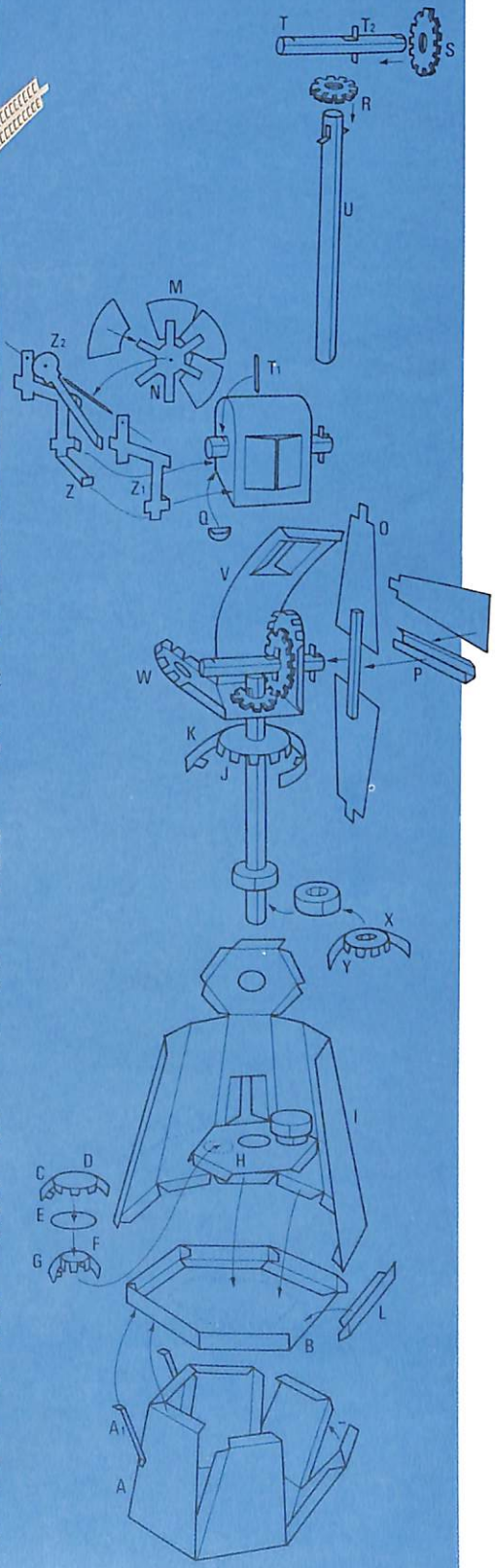
2 Cut out sail shaft **P**, fold along dotted line and glue to make rectangular shaft. Repeat for second shaft. Cut out four sails **O**. Cut small vents and bend outwards if you wish.

3 Apply glue up to dotted lines on sails. Glue sails to shafts. Repeat for second pair of sails. Glue centres of shafts together at right angles.

4 Fold end flaps in horizontal shaft **T** outwards. Glue to sail shaft **P**.

5 Cut out fantail supports **Z**, **Z1** and **Z2**. Pierce holes at dots. Fold at dotted lines. Glue **Z** to **Z1**. Glue supports to side **W**, placing **Z2** in centre.

6 Insert pin through **Z**, **Z2**, vane assembly **M/N**, then **Z1**.



CHART

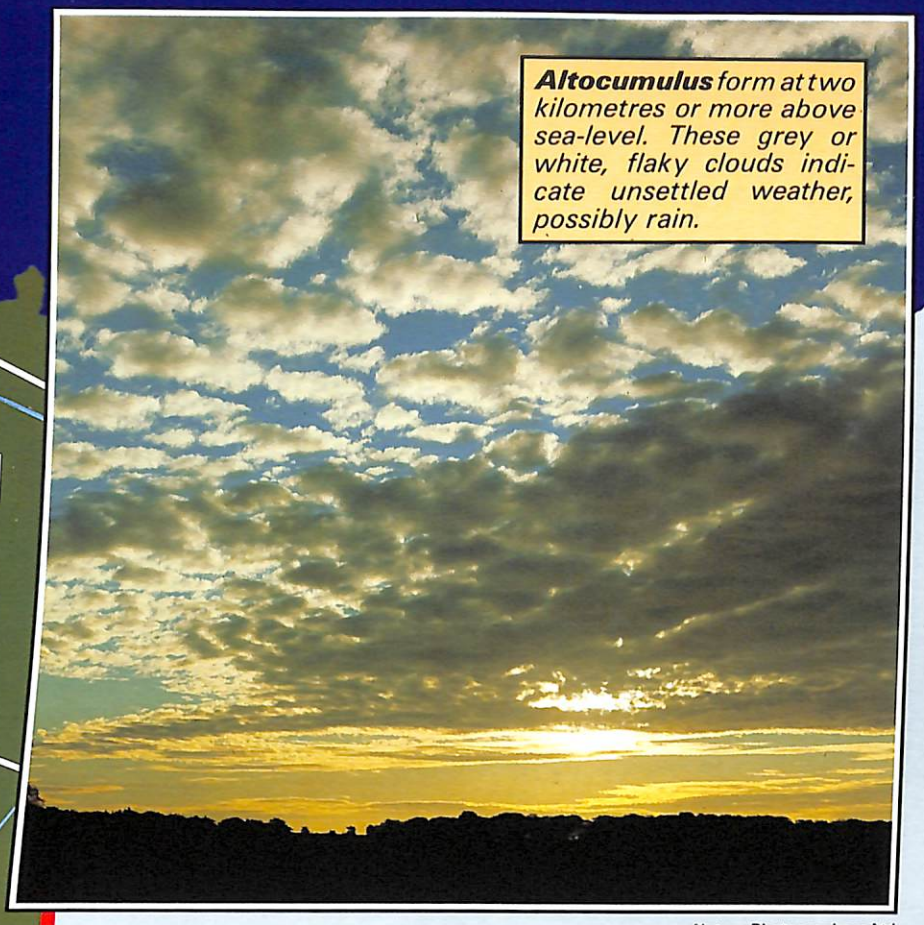
HIGH

1032

1024

1016

COL



Altocumulus *form at two kilometres or more above sea-level. These grey or white, flaky clouds indicate unsettled weather, possibly rain.*

Nature Photographers Ltd.

PRESSURE

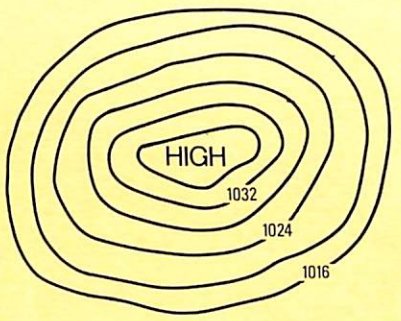
Pressure is measured in millibars, using barometers. Millibars indicate the force with which air is pushing down on the earth's surface at any given point. They are written on the isobars to show the various pressure levels in a high or a low.

ISOBARS

Circular lines on a weather chart are called isobars. They represent points of equal pressure and are usually drawn at four or eight millibar intervals.

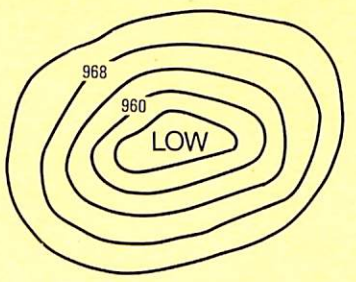
HIGH (ANTICYCLONE)

Moving towards the centre of a high, pressure builds up slowly as shown by the millibars. Areas of high pressure bring dry, sunny weather – but not necessarily hot weather.



LOW (CYCLONE OR DEPRESSION)

Pressure drops towards the centre of a low (illustrated by the millibars) bringing wet, cloudy weather.



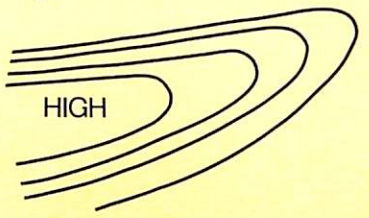
WINDS

Surface winds blow along the lines of isobars. When the isobars are close together, strong winds occur – when they are far apart, winds are light.

In the northern hemisphere winds blow clockwise in a high and anti-clockwise in a low. In the southern hemisphere, the opposite occurs.

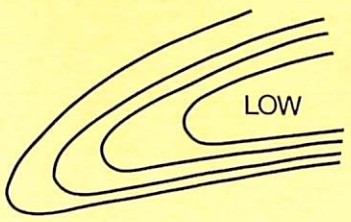
RIDGES

A ridge, which can appear in a high, occurs when there are great *differences of pressure arising in the surrounding area. Pressure builds up ahead of the ridge and falls behind it. The effect of a ridge on the weather is similar to that of a high.*



TROUGHS

In a trough of low pressure the opposite situation to a ridge occurs – pressure falls ahead of the trough and rises behind it. Troughs normally bring cloudy, showery weather.



COLS

These are neutral areas arising between two highs and two lows. They don't last long and don't cause any particular kind of weather.

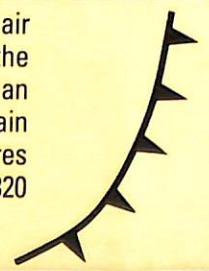
ER CLOUDS — SNOW
RVALS — HAIL
NNY INTERVALS — SLEET
RM — RAIN
AND DIRECTION — FOG FOG

FRONTS

These are the boundaries between air masses. Where there's a front you can expect unsettled weather. There are three types.

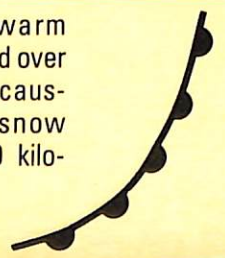
COLD FRONT

Advancing cold air pushes under the warm air. This can cause heavy rain for 80 kilometres and showers for 320 kilometres.



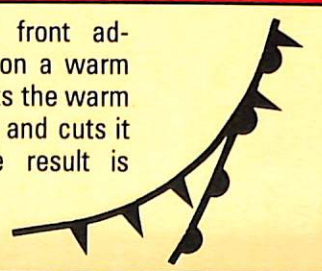
WARM FRONT

Advancing warm air rises up and over the cold air, causing rain or snow for about 320 kilometres.



OCCLUDED FRONT

A cold front advances on a warm front, lifts the warm front up and cuts it off. The result is rain.



QUEST

WEATHER C

HIGH

LOW
953

960

968

976

984

992

1000

1008

12

15

12

15

12

13

15

15

15

13

20

15

14

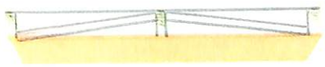
15

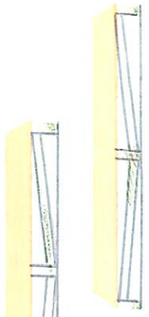
The Atlantic Chart *shows a deep depression with its associated weather fronts. The closeness of the isobars indicates strong winds, with cloudy, rainy weather occurring along the fronts. The small chart (inset left) shows the type of weather occurring in the British Isles as a result of the Atlantic depression.*

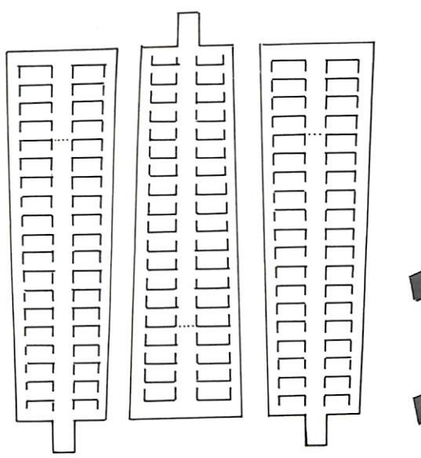
WEATHER SYMBOLS

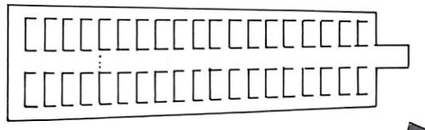
- 15 DEGREES ABOVE ZERO
- -3 DEGREES BELOW ZERO
- 25 SUNSHINE (and temperatures 25°C or over)
- FINE WEATHER CLOUDS
- DULL WEATH
- SUNNY INTER
- RAIN AND SU
- THUNDERST
- 30 WIND SPEED

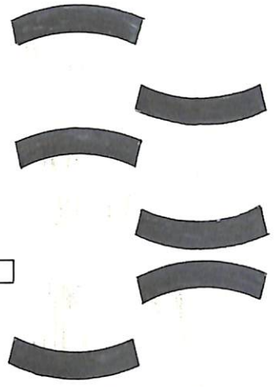
Mark Franklin

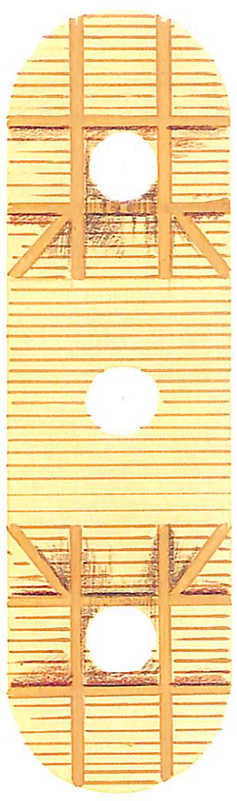


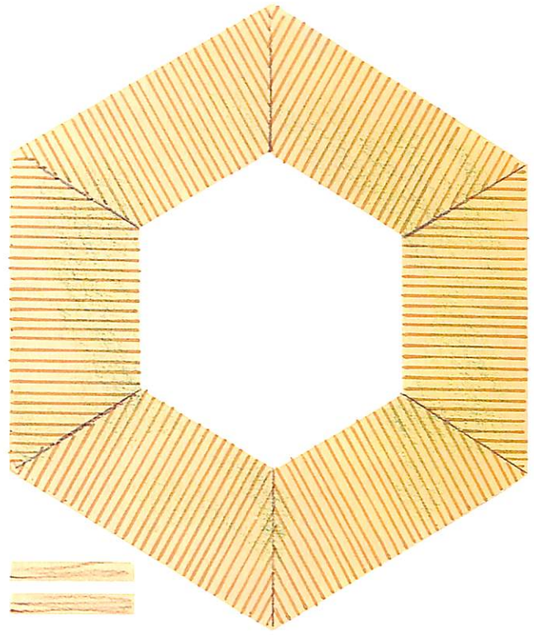












WINDMILL